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FOR

SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR PREPAID WIRELESS VOICE COMMUNICATION AND IP SERVICES

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SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR PREPAID AND WIRELESS VOICE COMMUNICATION AND IP SERVICES

RELATED APPLICATION(S)

The present application claims the priority of a provisional application filed June 12, 2000 under serial number 60/210,966, and which is incorporated herein by reference in its entirety. The present application is further related to a co-pending application filed concurrently herewith under the title "SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR CHARGING FOR COMPETITIVE IP-OVER-WIRELESS SERVICES" and docket number XACCTP004 and naming Limor Schweitzer as inventor, and a co-pending application filed concurrently herewith under the title "SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR ALLOWING A CARRIER TO ACT AS A CREDIT-APPROVAL ENTITY FOR E-COMMERCE TRANSACTIONS" and docket number XACCTP006 and naming Limor Schweitzer as inventor, which are each incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

The present invention relates to wireless networks, and more particularly to prepaying for wireless network usage.

BACKGROUND OF THE INVENTION

Telecommunications network products are services provided by telephone companies that are carried out on telecommunications networks. A widely known example is dial-1 long-distance voice service which allows a customer to dial a 1 plus a ten digit number from his or her home telephone, talk to a party who answers

the telephone on the line of the ten digit number dialed, and pay for the telephone call when billed at the end of the month. Although dial-1 is popular, other calling and payment options are sometimes preferable, such as the option to make a call from a phone other than the home phone and charge the call to the home phone account using a calling card.

One such calling and payment option is debit calling which is also referred to as prepaid calling. Debit calling allows a customer to put funds in an account and have those funds debited each time a telephone call is made. Standard debit call processing includes verification of the account balance prior to connecting the call and ongoing balance verification during the call. An example of a typical debit calling customer is a parent who purchases a debit calling card for a child away from home. Such debit calling is particularly prevalent in the wireless network environment.

The invention is a method and apparatus and will be described as applied to a cellular or wireless telephone and network of the (Global System for Mobile Communication (GSM) type. It should be understood however that the invention is not limited to such GSM cellular wireless network nor to telephones, but may find application elsewhere, wherever there is provision of services and/or goods which are paid for with prepaid smart cards or the like. For the GSM, a particular packet mode data transfer service GPRS (General Packet Radio Service) has been developed.

Prior art Figure **1a** shows a block diagram of principal components in the operation of the GPRS system. A packet switching controller SGSN (Serving GPRS Support Node) controls the operation of packet switching service on the cellular network side. The packet switching controller SGSN controls the sign-on and sign-off of the mobile station MS, the updating of the location of the mobile station MS and the routing of data packets to their correct destinations. The mobile station MS is connected to the base station subsystem BSS through a radio interface Um. The

base station subsystem is connected to the packet switching controller SGSN through the BSS-SGSN interface Gb.

In the base station subsystem BSS, the base station BTS and the base station controller BSC have been connected to each other by a BTS-BSC interface Abis. The location of the packet switching controller SGSN in the mobile station network can vary, for example, according to which technical implementation is being used. Although in Figure **1a**, the packet switching controller SGSN has been marked outside the base station subsystem BSS, the packet switching controller SGSN can be placed, for example, as a part of the base station BTS connected to the base station subsystem BSS or as a part of the base station controller BSC.

With the various components of a conventional GPRS system of Figure **1a** now described, a more comprehensive system will now be disclosed. In particular, Prior art Figure **1b** illustrates a GPRS system including the various components discussed in Figure **1a** hereinabove, i.e. SGSN, BSS, etc., in addition to other conventional components. For example, the GPRS system of Figure **1b** includes a packet switching controller GGSN (Gateway GPRS Support Node), Home Location Registers (HLRs), Mobile Switching Centers (MSC), Gateway Mobile Services Switching Center (GMSC), Equipment Identity Register (EIR), Mobile Telephone Network (PLMN), Pilot Directory Number (PDN), Switching Center/Visitor Location Register (MSC/VLR), etc.

In addition to the above components of Figure **1b**, a billing system **100** is included for charging customers for use of the GPRS system. Traditionally, such billing system **100** interfaces with a CGF (Charging Gateway Framework) which, in turn, interfaces with the SGSN and the GGSN via a conventional interface, Ga.

The prior art billing system **100** collects information from the GPRS equipment. Such information often takes the form of call description records (CDRs). CDRs traditionally provide a record of called numbers, and a date, time,

length and so on of each telephone call. In use, the approach takes the GPRS CDRs, collects them into the CDF, does some processing (such as mapping call-start with call-end) and sends the CDRs to the billing system **100**. This is done for the purposes of charging for wireless network voice communication using the debit billing account.

While such billing system **100** is ideal for charging for wireless network voice communication via a debit account, problems arise when the wireless network is used for data communication utilizing Internet Protocol (IP). The billing system **100** may use the debit account only for the amount of general wireless network voice communication, and cannot be used to administer payment based on any type of IP-specific usage.

There is therefore a need for a technique of using a debit account for IP usage in a wireless network environment.

DISCLOSURE OF THE INVENTION

A system, method and computer program product are provided for affording a digital wallet for Internet Protocol (IP) usage utilizing a wireless network. Initially, a request is received for a debit account. Such request includes payment for such debit account. In response to the request, the debit account is enabled. Payment for wireless network voice communication over a wireless network is then collected by billing against the debit account. Further, payment for IP usage is collected by billing against the debit account. Such IP usage is carried out using the wireless network.

In one embodiment of the present invention, the request may be received via a mobile cellular hand set, and the debit account may be enabled by a human operator. Payment may be received via a credit account. Further, the balance of the debit account may be updated in real-time.

As an option, an alert may be sent to a user upon the debit account falling below a predetermined amount. The wireless network voice communication and the IP usage may also be discontinued upon the debit account falling below a predetermined amount.

As an option, the wireless network voice communication may use the wireless network via a mobile cellular handset. Further, the wireless network voice communication may use Wireless Application Protocol (WAP). As a further option, the IP usage may include data transfer utilizing IP. Moreover, the IP usage may include payment for goods or services utilizing IP, and/or communication, i.e. conferencing, utilizing IP.

In another embodiment, the payment may be made from a previous debit account before enabling the debit account in response to the request. As an option,

the previous debit account may be adapted for voice communications only. Further, the transfer may be carried out on a mobile unit.

In still another embodiment of the present invention, the wireless network voice communication and the IP usage may be limited based on a user-defined threshold. Such user-defined threshold limitation may expire after a predetermined time period. Further, the user-defined threshold limitation may expire upon receipt of a key. As such, another user may engage in the wireless network voice communication and the IP usage upon receipt of the key.

Optionally, a plurality of users may engage in the wireless network voice communication and the IP usage using a single debit account. Further, the wireless network voice communication and the IP usage may be limited for each of the users based on a single threshold associated with the debit account.

BRIEF DESCRIPTION OF THE DRAWINGS

Prior art Figure **1a** shows a block diagram of principal components in the operation of a General Packet Radio Service (GPRS) system;

Prior art Figure **1b** illustrates a GPRS system including the various components discussed in Figure **1a** hereinabove in addition to other conventional components;

Figure **2** illustrates a method for providing payment for Internet Protocol (IP) usage utilizing a wireless network;

Figure **3** illustrates a schematic showing various exemplary features associated with the method of Figure **2** in accordance with one preferred embodiment of the present invention;

Figure **4** shows an exemplary accounting system and the manner in which it interfaces with a General Packet Radio Service (GPRS) system for collecting the IP content usage information and call description record information in accordance with Figure **3**;

Figure **5** shows a flow of information using the system of Figure **4** in accordance with one preferred embodiment of the present invention; and

Figure **6** illustrates a set of records and the ways they are correlated and aggregated to obtain a table that presents a real-time view of the total resource consumption for all multi-party customers.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure **2** illustrates a method **200** for providing payment for Internet Protocol (IP) usage utilizing a wireless network. Initially, in operation **202**, a request is received from a user for a debit account. Such request may be received via a telephone or a computer terminal over a network. It should be noted that this may be accomplished via a human operator or an automated mechanism. For example, in one embodiment of the present invention, the request may be received via a mobile cellular hand set, and the debit account may be enabled by a human operator. In the alternative, a form may be submitted by way of ground mail.

In any case, the request may include payment for the debit account. Such payment may be made utilizing a credit account, a bank account, cash or any other desired payment scheme capable of transferring value.

In response to the request received in operation **202**, the debit account is enabled. See operation **204**. Again, this may be accomplished by a human operator or an automated mechanism. As an option, the debit account may be enabled by providing the user with an identifier, establishing a value of the debit account, and/or any other steps that allow or facilitate payment for IP usage utilizing a wireless network.

During use, payment for wireless network voice communication is then collected by billing against the debit account. Note operation **206**. As an option, the wireless network voice communication may use the wireless network via a mobile cellular handset. Further, the wireless network voice communication may use Wireless Application Protocol (WAP), or any other type of communication using the wireless network for voice communication.

Further, in operation **208**, payment for IP usage is collected by billing against the debit account. Such IP usage is carried out using the wireless network. As an option, the IP usage may include data transfer utilizing IP. Moreover, the IP usage may include payment for goods or services utilizing IP, and/or communication, i.e. conferencing, utilizing IP. In other embodiments, IP usage may refer to any type of activity involving Internet Protocol.

Figure **3** illustrates a schematic showing various exemplary features associated with the method of Figure **2** in accordance with one preferred embodiment of the present invention. As shown, unrated IP content usage information is collected that is associated with content of the customer communication using the Internet Protocol. Note operation **302**. Such content usage information may include, but is not limited to a session's source, destination, user name, duration, time, date, type of server, volume of data transferred, etc.

Thereafter, in operation **304**, the unrated events are rated using SEPRO, SOLECT, MINIRATER, or any other type of commercially available rating engine. Such rating engine is capable of outputting a price and optionally a user identifier, time, and/or service identifier given the unrated IP content usage information.

In addition to the unrated IP content usage information, further collected is rated IP content usage information in the form of e-commerce related events. Note operation **306**. Similar to the output of the rating engine, the rated IP content usage information associated with the e-commerce related events includes a price and optionally a user identifier, time, and/or service identifier. It should be noted that such rated IP content usage information does not necessarily require a rating engine.

Also collected is call description record information, as indicated in operation **308**. Such call description record information is received from a wireless network, and is associated with customer communication over the wireless network. In one embodiment, the call description record information may include

conventional CDRs or any other data structure that is collected from a GPRS or other wireless system, and is descriptive of calls that take place thereover. Further information regarding the collection of call description record information will be set forth in greater detail during reference to Figure **4.**

In accordance with operations **206** and **208** of Figure **2**, payment for the identified wireless network voice communication and the IP usage is collected by using the IP content usage information and call description record information to bill against a debit account **310**. During the process of collecting payment, various other features may be optionally implemented, as will now be set forth. For example, payment may be received via a credit account. Further, the balance of the debit account may be updated in real-time, and in units of dollars.

As an option, the user may transfer payment from another pre-paid debit account such as one previously established for voice only wireless communications (e.g. 2G wireless networks, GSM, PCS, etc.). This may require provisioning beforehand that links accounts, or requested in real-time by the user. When requested in real-time, the user may using his/her mobile terminal to enter the account and authentication information of his voice only debit account; then requested payment amount is entered. This triggers the transfer of payment from the voice only debit account to the debit account **310**.

This option is especially useful during the migration of the current 2G wireless networks to the 3G wireless networks. As 2G systems are currently enjoying high level of interoperability, many 2G pre-paid accounts and related infrastructure exist. The 3G wireless systems initially may not have wide deployment, thus may lack a good infrastructure to offer pre-paid services. This option thus enables a smooth transition of pre-paid services from 2G voice only networks to 3G voice/data integrated wireless networks.

Further, in operation **312**, an alert may be sent to a user upon the debit account falling below a predetermined amount. The alert may take the form of an e-mail notification, short telephone , ground mail, etc. As an option, the wireless network voice communication and the IP usage may also be discontinued within a certain time frame upon the debit account falling below a predetermined amount.

In operation **314**, the wireless network voice communication and the IP usage may be limited based on a user-defined threshold. Such user-defined threshold may be determined at the time of setting up the debit account in accordance with operations **202** and **204** of Figure **2**, or any other time during use. One example of a threshold may include a certain amount of money in the debit account that may not be used. Of course, other types of thresholds, i.e. communication and usage thresholds, may be used to limit use. As an option, the threshold-based limitation may expire after a predetermined time period. This may allow for at least a portion of the user's money to be temporarily blocked from use.

Further, the user-defined threshold limitation may expire upon receipt of a key. The key may take the form of a personal identification number (PIN), or any other identification mechanism. Similar to the user-defined thresholds, the wireless network voice communication and the IP usage may be optionally blocked for a certain time period before allowing the key to be utilized.

In one embodiment, a plurality of users may engage in the wireless network voice communication and the IP usage using a single debit account. Further, the wireless network voice communication and the IP usage may be limited for each of the users based on a single threshold associated with the debit account. In the corporate environment, a corporate account may be provisioned when personal or corporate balance reaches the threshold. It should be noted that single user and multiple user thresholds may both be executed in the present embodiment.

In order to accomplish this, the amount of wireless network voice communication and the IP usage of each of the users is maintained in a database **316**. Accordingly, multiple digital wallet accounts can co-exist in a distributed environment, and a customer care system may refill a wallet with money by accessing the database **316**. As an option, high-end databases may be used to provide an overall higher reliability.

By providing the above multiple-user capability, the present invention may be useful for departmental budgeting. For example, a manager may be allowed to control expenses of a common budget of a group of employees. Further, individual employees may be permitted to "overdraft" travel expenditures at the expense of a common money pool. Further applications may involve parents who wish to control family expenditures. In particular, parents would be allowed to explicitly control how their kids can spend money, and budget communication and commodity purchases.

Figure **4** shows an exemplary accounting system **400** in accordance with one preferred embodiment of the present invention and the manner in which it interfaces with a General Packet Radio Service (GPRS) system **402** for collecting the IP content usage information and call description record information in accordance with operations **302-308** of Figure **3**. As shown, the exemplary system **400** includes a plurality of data gatherers **404** which are in turn a component of a plurality of information source modules (ISMs). Such ISMs interface with the Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN) of the GPRS system **402** for receiving the call description records (CDRs) therefrom.

This may be accomplished by receiving CDRs directly from the SGSN and/or GGSN. In the alternative, the present invention may support the Ga protocol as described by European Telecommunications Standards Institute (ETSI) specs, accepting all types of CDRs produced by SGSN and GGSN. This provides mobility, short message service (SMS), and quality of service (QoS). It should be noted,

however, that the accounting system **400** may interface with the GPRS system by any desired means. . The accounting system **400** may monitor all the traffic (e.g. user traffic, control/management traffic, network signaling, etc.) carried over any interface in the GPRS system. This enables the accounting system **400** to collect real-time information associated with customer communication over the wireless network as well as IP content usage.

As an option, the system **400** may use the received CDRs to map IP content events to ISMs, resulting in a new type of call description records, XDRs. Such XDR's get fed into rating engines and then to a standard content based billing module **406**. It should be noted that as real-time information is gathered by the system **400**, various services can be provided based on collected information; e.g. billing, fraud detection, pre-paid service, QoS monitoring, network performance based dynamical provisioning, etc. For more information on how one exemplary content based billing module **406** operates, reference may be made to PCT application WO9927556A2 entitled "NETWORK ACCOUNTING AND BILLING SYSTEM AND METHOD" published June 3, 1999, and which is incorporated herein by reference in its entirety. The present invention may thus use GPRS CDRs in a non-conventional way, mixing them with IP content usage records before feeding them to billing and customer care systems.

Figure **5** shows a flow of information using the system **400** of Figure **4**. As shown, a plurality of IP-enabled mobile communication units **502** are provided which are adapted to connect to a base station BSS **504** over a Global System for Mobile Communication (GSM) **506** or any other wireless network.

A packet tunnel **508** is then created from the handset through a SGSN of the BSS **504** to a router **510** logically located in the GGSN. From that router **510**, the packets are outputted to the operator's IP network **512**. A LDAP Radius server **514**

may be provisioned so that whenever mobile communication units belonging to these corporate customers "log-in" to the network, they will be given an IP address.

The present invention may collect the accounting information from the different parts of the network, correlating GPRS info with IP content in a manner set forth in a co-pending patent application filed concurrently herewith under the title "SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR CHARGING FOR COMPETITIVE IP-OVER-WIRELESS SERVICES" and docket number XACCTP004 and naming Limor Schweitzer as inventor, and which is incorporated herein by reference in its entirety. Converged data records may be sent to be rated and then sent to the debit account mechanism **516.**

Figure **6** illustrates a set of records and the ways they are correlated and aggregated to obtain a table **620** that presents a real-time view of the total resource consumption for all multi-party customers, in accordance with one embodiment of the present invention.

The IP usage information of individual mobile users (typically associated with an IP address) is collected and stored in probe records **602**, web proxy records **604**, and voIP records **606**. By correlating and aggregating the IP usage information with user information stored in an LDAP **608**, GPRS **610**, and database **612**, aggregated IP usage information is obtained that are stored in aggregated netflow records **614**, aggregated web proxy records **616**, and aggregated voIP records **620**. Based on the aggregated usage information, a table **620** is constructed in the manner shown to present a real-time view of the total resource consumption for all multi-party customers.

In use, the table **620** may be rated and billed against the debit accounts set up for these users.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.